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New Study Tracks Prenatal, Newborn and Childhood Exposure to Common Insecticide

A study in Frontiers in Public Health is one of the few studies to investigate pyrethroid exposure concentrations in the urine of newborns and children within their first year of life.

By Beyond Pesticides

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In addition to maternal exposure, children experience exposure to pyrethroid insecticides earlier in life as levels significantly increase post-natal (after birth), according to a study published in Frontiers in Public Health.

This study is one of the few studies to investigate pyrethroid exposure concentrations in the urine of newborns and children within their first year of life.

However, this research reiterates what many other studies demonstrate on pyrethroids' impacts on children's health, primarily due to their notorious neurotoxic properties.

The findings indicate that exposure to pyrethroids during pregnancy and early childhood exposure has links to adverse health effects, including neurodevelopmental delays (e.g., autism), behavioral issues (e.g., attention-deficit/hyperactivity disorder, or ADHD), and endocrine disruption (e.g., delay in puberty).

Pesticide exposure during pregnancy is of specific concern as health effects for all life stages can be long-lasting. Just as nutrients are transferable between mother and fetus, so are chemical contaminants.

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Studies find pesticide compounds in the mother's blood can transfer to the fetus via the umbilical cord. Therefore, pesticide exposure during pregnancy affects both the mother and child's health.

Beyond Pesticides has covered a variety of pregnancy risks from pesticides and other toxic chemicals, including these in just the last three years: pesticides and children's sleep disorders; prenatal exposures to a multitude of chemicals; insecticides and childhood leukemia; and insecticides and ADHD.

The study evaluated concentrations of pyrethroid insecticides from exposure among 142 pregnant women in Rio de Janeiro, Brazil, and their children during birth and in the first, third and sixth months of life.

Researchers measured pyrethroid concentrations in urine via metabolites (breakdown products) of the insecticides 3-phenoxy benzoic acid (3-PBA) and 4-fluoro-3-phenoxybenzyl acid (4-FPBA).

The results find 3-PBA more frequently in the urinalysis of pregnant women (47%) as it is the metabolite of more common pyrethroids used in Brazil, like cypermethrin, cyhalothrin, deltamethrin esfenvalerate and permethrin, compared to 4-FPBA, a metabolite of cyfluthrin, in 11% of pregnant women.

Ten percent of children's urine samples have detachable 3-PBA levels after birth. However, the levels of 3-PBA increase with age, as 21% of the children's urine samples during the third and sixth months of life contain detectable levels of pyrethroids.

The study highlights that the presence of pyrethroids in newborn urine indicates exposure through the mother during gestation (pregnancy), and continued exposure through the first year of the child's life can be due to exposure through breast milk, food consumption and the use of pyrethroid-based insecticides indoors.

Prenatal and early-life exposure to environmental toxicants increases disease susceptibility, as women living near agricultural areas experience higher exposure rates that increase the risk of birthing a baby with abnormalities, including brain malformations.

A 2011 study found that children exposed to higher levels of synthetic pyrethroids are three times as likely to have mental delays compared to less exposed children.

Additionally, a 2014 study associates proximity to pesticide-treated agricultural fields in pregnancy with an increased risk of autism in children of exposed mothers.

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Two studies published in 2015 found that deltamethrin increases the risk of ADHD in children, with one study finding impacts specifically on boys.

Studies published in 2017 found that synthetic pyrethroid exposure increases the risk of premature puberty in boys, and another associated the chemicals with externalizing and internalizing disorders. The impacts seen are not all developmental.

A 2012 study associates pyrethroid exposure before, during, and after pregnancy with an increased risk of infant leukemia, with a 2013 finding exposure to permethrin (a pyrethroid) in utero is linked to an increased risk of infant leukemia diagnosed before age 2.

More recently, a 2022 study finds that synthetic pyrethroid exposure during mosquito control operations increases the risk of respiratory disease and specific allergies.

This study highlights that people living within the study area have used household pesticides within the previous year, with over 80% of those household pesticides containing pyrethroids.

Thus, the rampant use of these chemicals can account for their presence in breast milk, transferring from mother to child through nursing. With this study being one of the few to assess urinary concentrations of pyrethroids in newborns and children during the first year of life, the results are relatively concerning.

The increase in pyrethroid metabolite concentrations in urine after birth highlights the potential adverse impacts on newborns, who are more vulnerable to the toxic effects of pollutants due to their immature immune systems.

This conclusion supports long-known concepts regarding the hazards of pesticides to children's health. Early life exposures during "critical windows of vulnerability" can predict the likelihood or otherwise increase the chances of an individual encountering a range of pernicious diseases.

There is a strong consensus among pediatricians that pregnant mothers and young children should avoid pesticide exposure during critical windows of development.

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However, the general population should follow this advice as the effects of pesticide exposure can affect every individual. Beyond Pesticides tracks the most recent studies on pesticide exposure through the Pesticide Induced Diseases Database, or PIDD.

This database supports the need for strategic action to shift away from pesticide dependency. For more information on the multiple harms of pesticide exposure, see PIDD pages on learning/developmental disorders, birth/fetal effects, sexual and reproductive dysfunction, body burdens and other diseases.

Additionally, learn more about the hazards to children's health through Beyond Pesticide's Pesticide and You journal article, "Children and Pesticides Don't Mix."

Fortunately, the wide availability of non-pesticidal and nontoxic alternative strategies allows for choices in residential and agricultural management to promote a safe and healthy environment, especially among chemically vulnerable individuals.

For instance, buying, growing, and supporting organic land management reduces human and environmental contamination from pesticides.

Organic agriculture has many health and environmental benefits, which curtail the need for chemical-intensive agricultural practices.

Numerous studies find that pesticide metabolite levels in urine significantly decrease when switching to an all-organic diet.

For more information on how organic is the right choice for consumers and the farmworkers who grow our food, see the Beyond Pesticides webpage on the health benefits of organic agriculture.

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The views and opinions expressed in this article are those of the authors and do not necessarily reflect the views of Children's Health Defense.

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Beyond Pesticides

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